USER'S GUIDE

T-368

Data Logger

Bluetooth GPS Receiver

V1.0

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1. Introduction

1.1 Overview

The ProGin T-368 Data logger GPS Receiver with LCD Display and Bluetooth enhanced is a total solution GPS receiver with Bluetooth, UART interface and built-in rechargeable battery for high sensitivity to tracking signal.

The **T-368** receiver incorporates a wireless Bluetooth radio module, a high sensitivity, high performance SiRF StarⅢ chipset, and a rechargeable battery in a compact design. The SiRF StarⅢ chipset is with extremely high sensitivity for GPS signal acquisition and tracking. This Bluetooth GPS receiver allows you to receive GPS data on mobile hand-held devices. By sending the GPS data wirelessly, you may place this receiver on a position with best signal reception without the constraint of annoying wires. The receiver is equipped with a portable, rechargeable, with removable battery, just like a mobile phone. The only requirement is your corresponding hand-held device is also with the Bluetooth connection capability. The receiver is very suitable for broad applications such as vehicle navigation, mapping, surveying, security, agriculture, etc. Only a clear view of sky and a battery power are necessary to the unit. With its low power consumption, the receiver tracks up to 20 satellites at a time while offering fast time-to-first-fix, re-acquires satellite signals less than 1 second (average) and updates position data every second.

1.2 Features

The T-368 provides a host of features that make it easy for integration and use.

SiRF
SiRF StarⅢ

1. With SiRF StarⅢ high sensitivity chipset.
2. High sensitivity and high performance receiver tracks up to 20 satellites.
3. High speed signal acquisition using 200,000 time/frequency search channels.
4. Built-in WAAS/EGNOS demodulator without additional hardware.
5. With the highly sensitive software to get the fast acquisition and reacquisition in the urban, canyon and foliage environments.
6. Equipped with Li-ion rechargeable battery for long operating hours.
7. Over temperature protection for the battery.
8. Compatible with Bluetooth devices with Serial Port Profile (SPP).
9. Built-in high gain antenna.
10. Three LEDs show Bluetooth, GPS, and battery status.
11. LCD Display shows time, longitude, latitude, elevation, etc.
12. SD card supported for data storage in text file.
13. Supports standard NMEA-0183 data protocol and SiRF binary code at **19200** baudrate.
14. Built-in rechargeable battery for memory and RTC backup and for fast TTFF.
15. Flash-based program memory, new software revisions upgradeable through serial interface.
16. Compact and sleek design ideal for portable applications.

1.3 Electrical Characteristics

General

Frequency	L1, 1575.42 MHz
C/A code	1.023 MHz chip rate
Channels	20 channels all in view tracking
Antenna	internal

Sensitivity

Tracking	-159 dBm typical

Accuracy

Position	< 10 meters, 2D RMS < 7 meters 2D RMS, WAAS corrected 1-5 meters, DGPS corrected
Time	1 microsecond synchronized to GPS time

Datum

Default	WGS-84

Acquisition Rate (Open Sky)

Hot start	1 sec, average
Warm start	38 sec, average
Cold start	42 sec, average
Reacquisition	0.1 sec, average

Dynamic Conditions

Protocol message	NMEA-0183

Default NMEA

Altitude	< 18,000 meters (60,000 feet)
Velocity	< 515 meters/sec (1,000 knots)
Acceleration	< 4 G
Jerk	20 meters/sec max
GPS protocol	GGA, GSA, GSV, RMC, **19200** baudrate, (GLL, VTG, and ZDA optional) 8 bits data, 1 stop bit, no parity.

Bluetooth Characteristics

BT Compliant	Version1.1
RF Tx Power	Class 2 (4 dBm max)
Receiver sensitivity	-80 dBm with BER<0.1%
Communication distance	10 meter typically
Communication profile	Serial Port Profile (SPP)

Power Consumption

Main power input	5.0 ± 5% VDC input
Operation Current	75 mA average in normal mode

Battery

Source	Rechargeable and removable 1200 mAh Lithium-ion battery with 5V DC input charging circuit
Charging time	Fully charged 2.5 hours typical
Operation time	12 hours after fully charged in continuous tracking mode

Environmental Characteristics

Operating temperature range	-10 °C to +60 °C
Storage temperature range	-20 °C to +70 °C
Charging temperature range	0 °C to +45 °C
Operating humidity：	5% to 95%, no condensing

Dimension 97.6 mm (L) x 45.8 mm (W) x 23.5 mm (H)

Weight <70 g (Battery & SD Card not included)

2. Hardware

2.1 Dimension

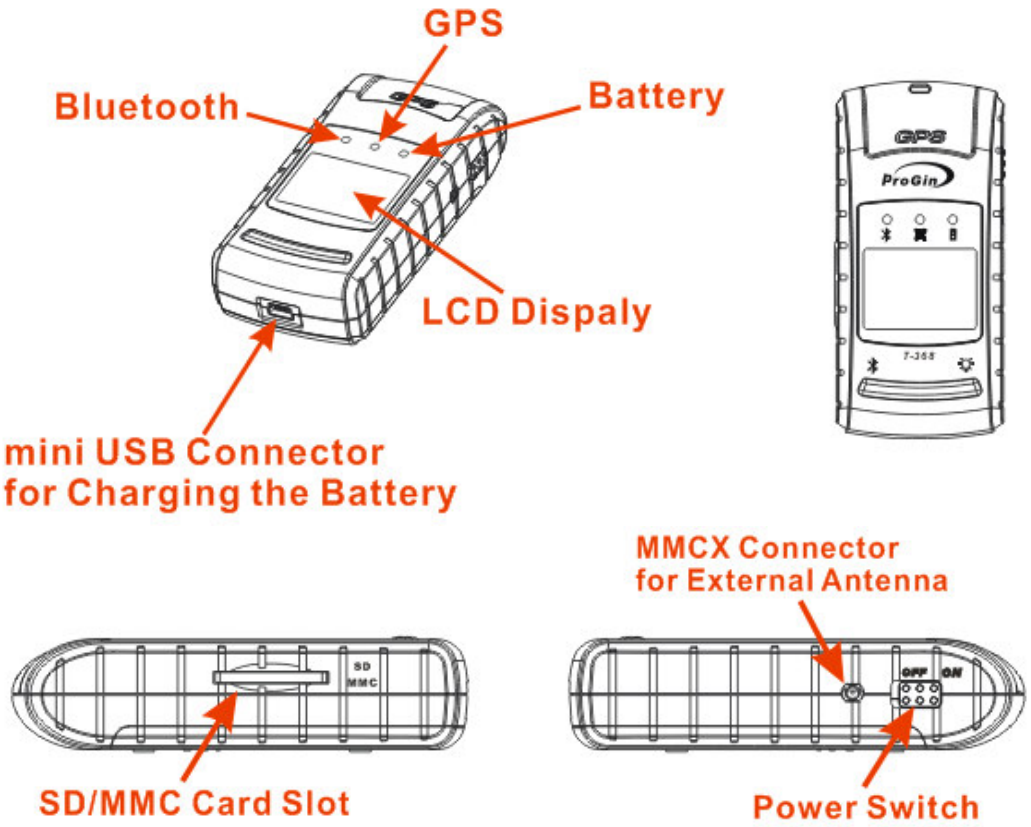
The receiver enclosure is with the dimension: **97.6 mm (L) x 45.8 mm (W) x 23.5 mm (H)**

2.2 Accessories

1, A 1200 mAh Lithium-ion rechargeable battery.
2, A vehicle lighter adapter assembly for battery recharge.
3, A household power adaptor assembly for battery recharge.
4, A USB cable assembly with “A” plug to mini USB plug.
5, User manual and CD.

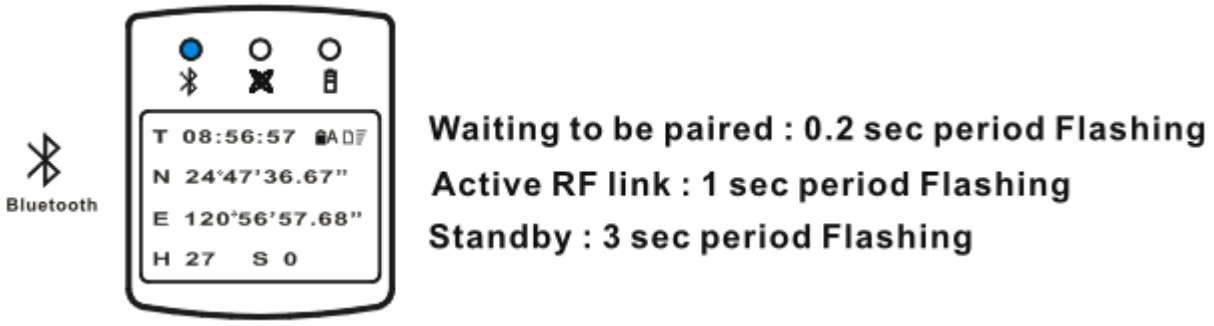
2.3 Description

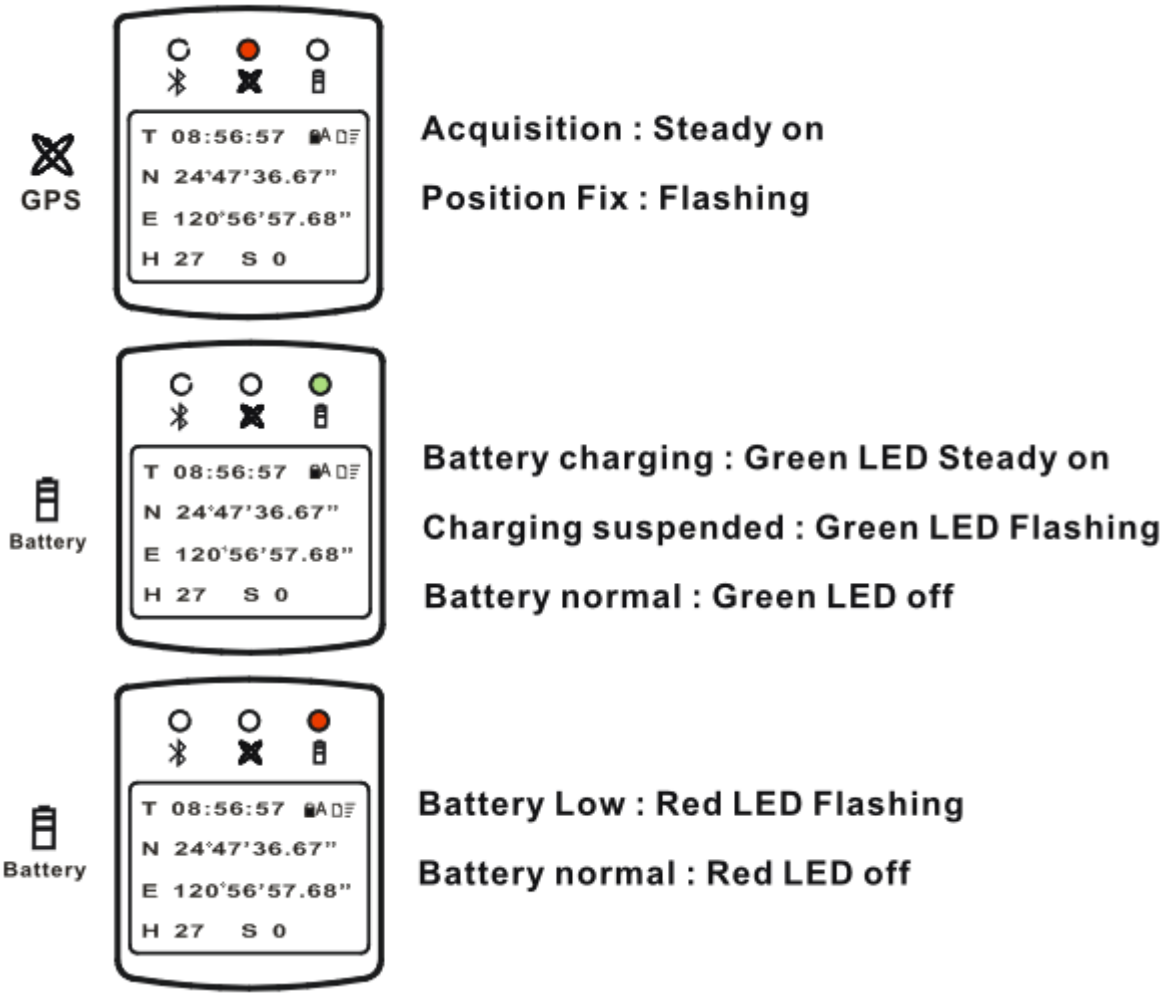
1, **Body of the Bluetooth GPS unit** is as shown in the figure.



There are three LED windows on the front cover to indicate the GPS, Bluetooth and battery status. One LCD display panel on the front cover shows time, longitude, latitude, height, speed, battery status, SD/MMC Card, and satellite signal status. Detailed LED and LCD indications are described in next paragraph. The battery on/off switch and MMCX connector is located on the same broadside of the body. There is a SD/MMC card slot located on the other broadside of the body. The mini USB port for charging the battery is on the down side of the body.

2, **LED status**

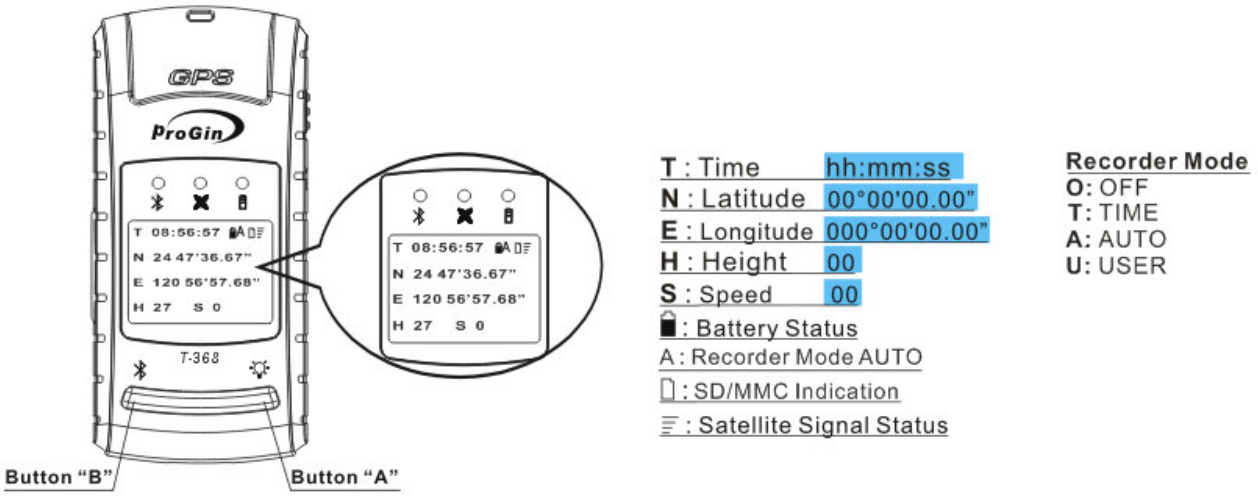

Bluetooth
T 08:56:57
N 24°47'36.67"
E 120°56'57.68"
H 27 S 0
Waiting to be paired : 0.2 sec period Flashing
Active RF link : 1 sec period Flashing
Standby : 3 sec period Flashing



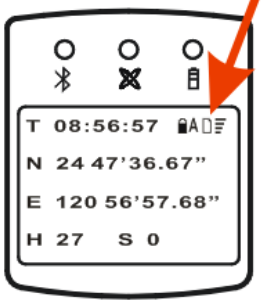
Remark: Battery charging suspended (protection when charging overtime or battery overheat)
Unplug the power plug and wait for a moment to resume charging.

3, **LCD Indication**

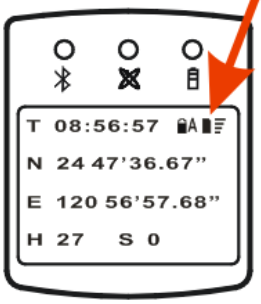
The LCD display panel shows the following message:



White icon shows no SD/MMC card in the slot.



Black icon shows with SD/MMC card in the slot.



ⓘ **Please put a SD/MMC card in the slot before turning on the device. The SD/MMC card should be formatted to FAT file system.**

4, **Bluetooth/Backlight usage** **(The default of Bluetooth/Backlight is ON.)**

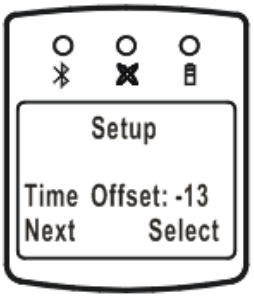
1. Under normal operation status, press button "A" for 1 second and then release to turn off/on Backlight.
2. Under normal operation status, press button "B" for 1 second and then release to turn off/on Bluetooth.

ⓘ **Under Recorder USER mode, the Bluetooth ON/OFF setting function will be disabled. If you want to turn on/off Bluetooth under USER mode, please use Bluetooth setup described in 5. Display Setup below.**

5, **Display Setup** **(Please refer to Appendix: Time Zone Table for time zone adjustment.)**

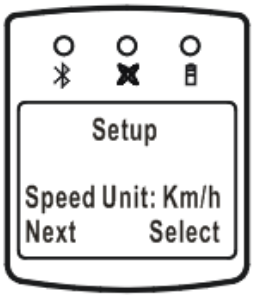
1. Press button "A" for 2 seconds then release to enter into setup menu.
2. Press "Select" for 1 second to increase the parameter figure.
3. Press "Next" for 1 second to select different parameters.
4. After finishing setup, press "Exit" for 1 second to back to operation status.

ⓘ **Whenever setting up, the power of the device must be turned off then on again to reactivate the signal.**

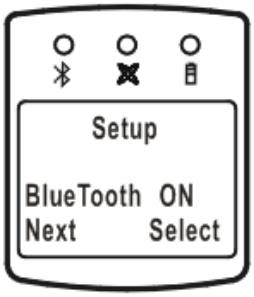


Time zone adjustment:
-13 ~ +13, press "Select" button every time +1
Figure loop from -13 to +13

Alarm Speed:
40-125, press "Select" button every time +5
Backlight flashing when over speed
Figure loop from 40 to 125



Speed Unit setup:
Km/h , Mi/h , Knot



BlueTooth Setup
ON, OFF

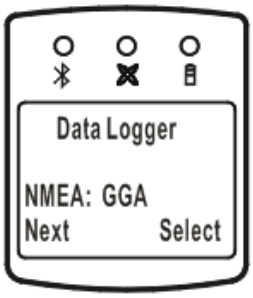
Exit :
Back to operation status

6, SD/MMC Recorder Setup **(The default of Recorder is AUTO.)**

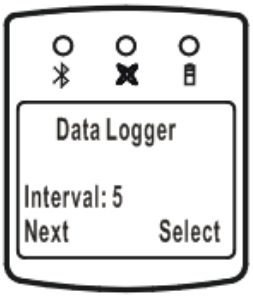
1. Press Button “B” for 2 seconds then release to enter SD/MMC recorder setup function
2. Press “Select” for 1 second to increase the parameter figure.
3. Press “Next” for 1 second to select different parameters.
4. Under USER mode, the Bluetooth ON/OFF setting function will be disabled. Press button “B” for 1 second to record, recording once per press button.
5. Under AUTO mode, the recording is as follows:

Speed	Record
0 Km/h	No record
Under 10 Km/h	Record once per 2 seconds
Under 40 Km/h	Record once per 5 seconds
Under 70 Km/h	Record once per 8 seconds
Under 100 Km/h	Record once per 10 seconds
Over 100 Km/h	Record once per 20 seconds

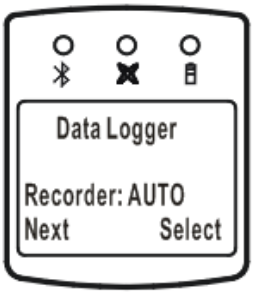
ⓘWhenever setting up, the power of the device must be turned off then on again to reactivate the signal.



NMEA Setup:
GGA, RMC, GGA RMC

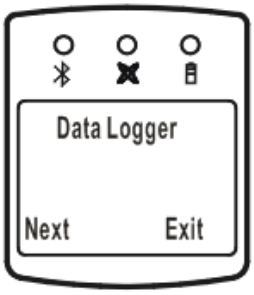


Interval Setup:
5-55, Press "Select" button every time +5
Figure loop from 5 to 55
Only effective under TIME mode
Record once per interval



Recorder Setup:
OFF, TIME, AUTO, USER
The default is "AUTO"

Record NO:
Shows how many recorded lines
after turning on the unit to present
(GGA or RMC record 1 line per record
GGA RMC record 2 lines per record)



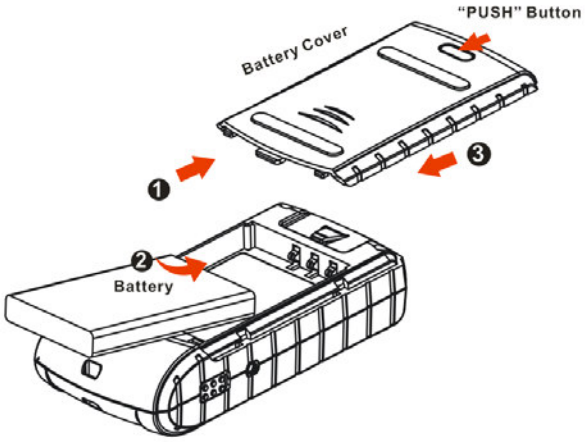
Exit :
Back to operation status

3. Operation

3.1 Getting Start

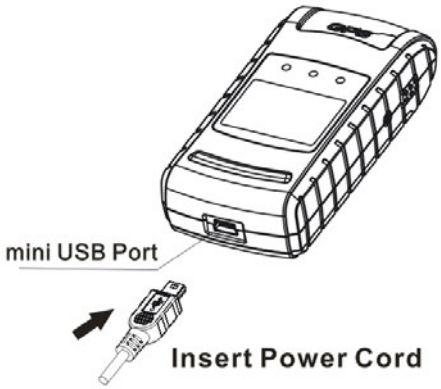
Step 1: Battery Installation

(a) Slide the power switch to "OFF" position.
(b) Press the "PUSH" button then slide the bottom cover off.
(c) Insert the Li-ion battery into the compartment. Note the orientation of the battery.
(d) Slide the bottom cover back to locked condition.



Step 2: Charge

Please charge the battery to full capacity when first time to use. Connect the attached adaptor cord to the mini USB jack, as shown in the following figure.

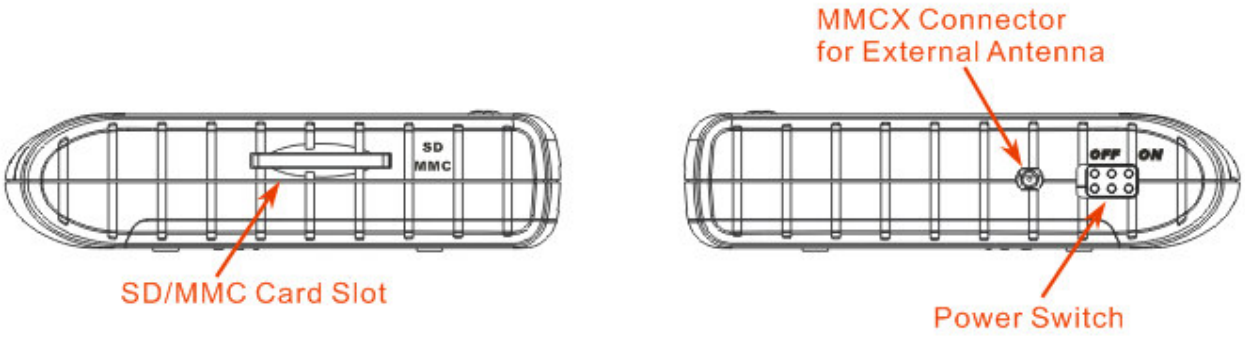


The battery indication is with dual-color LEDs. The **green LED** will be on until charge completes. The LED indication for the battery status is described in the following.

Battery low ---------- **Red LED** flashing
Battery in charging ---------- **Green LED** steady on
Battery charging suspended (protection when
charge timer over or battery overheat) ---------- **Green LED** flashing
Charge completes or battery in normal capacity ---------- both LEDs off

Step 3: GPS acquisition

Turn the power switch "on." The slide switch is on the broadside of the body. Once the power is turned on, both the Bluetooth and GPS indication LEDs start to flash.



Take the Bluetooth GPS to places with clear view of the sky. The **Red LED** indicates the status.

(a) LED steady on when power is connected and for the initial acquisition process;
(b) LED flashes at 1 second on and 1 second off when the receiver outputs position fix data.

Step 4: Wireless Link

Turn on the host device, a PDA or a NB with Bluetooth function. Then execute Bluetooth manager program to perform "search" and "pair" procedures. The default PIN code is "0000" for host devices to access this BT GPS unit (in paired mode).

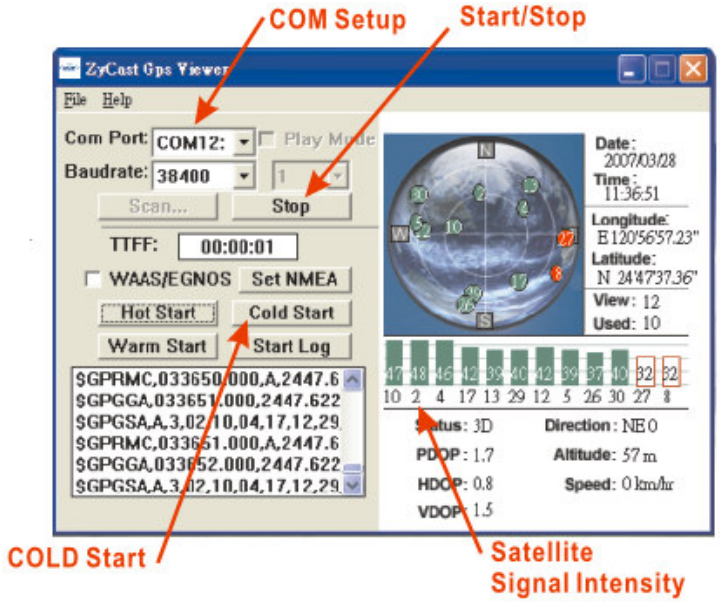
The **Blue LED** indicates following Bluetooth radio status.

(a) LED flashes at 3 seconds interval for standby mode;
(b) LED flashes at 0.2 second interval for pairable mode;
(c) LED flashes at 1 second interval if there is an active RF link.

3.2 GPS Viewer for Testing

Install a GPS Viewer program to host device. You may check the status of the GPS receiver whenever you like to. Following are standard buttons and operation steps.

(a) Execute the Viewer program. Press the "Com Port:" button to set "Com Port" for this data link and the "Baudrate" to any one of 2400, 4800, 9600, 19200, 38400…
(b) Click "Start" to receive data. Usually a window shows the NMEA format data stream while another window shows tracked satellites signal quality.
(c) Once the link is successful, click "Stop" button to stop the program. However, you may click, for example, the "Cold Start" button to perform "cold start" testing.



3.3 Function

As soon as the power on, the T-368 Bluetooth GPS receiver begins the process of satellite acquisition, tracking, and Bluetooth radio connection. Under normal circumstances, it takes around 42 seconds (average) to achieve a position fix at the first time. After a position fix has been calculated, information about valid position, velocity, and time is transmitted over the output channel. The T-368 Bluetooth GPS receiver utilizes initial data, such as last stored position, date, time and satellite orbital data, to achieve maximum acquisition performance. If significant inaccuracy exists in the initial data or the orbital data is obsolete, it may take more time to achieve a navigation solution.

3.4 Navigation

After the acquisition process is complete, the T-368 Bluetooth GPS receiver sends valid navigation information over output channels. These data include:

1) Latitude/longitude/altitude
2) Velocity
3) Date/time
4) Error estimates
5) Satellite and receiver status

4. Warranty

The GPS smart receiver is warranted to be free from defects in material and functions for one year from the date of purchase. Any failure of this product within this period under normal conditions will be replaced at no charge to the customers.

Appendix: Software Specifications

NMEA Protocol

The T-368 interface protocol is based on the National Marine Electronics Association (NMEA) interface specification, namely, the NMEA 0183 standard. The T-368 is capable of supporting the following NMEA message formats specifically developed and defined by SiRF.

NMEA Message Prefix	Format	Direction
$GPGGA	Time, position and fix type data.	Out
$GPGLL	Latitude, longitude, time of position fix and status.	Out
$GPGSA	GNSS DOP and active satellites	Out
$GPGSV	Satellites in view.	Out
$GPMSS	Radio beacon signal-to-noise ratio, signal strength, frequency, etc.	Out
$GPRMC	Recommended minimum specific GNSS data.	Out
$GPVTG	Speed and course over ground.	Out
$GPZDA	Date and time.	Out

General NMEA Format

The general NMEA format consists of an ASCII string commencing with a '$' character and terminating with a <CR><LF> sequence. NMEA standard messages commence with 'GP' then a 3-letter message identifier. The message header is followed by a comma delimited list of fields optionally terminated with a checksum consisting of an asterix '*' and a 2 digit hex value representing the checksum. There is no comma preceding the checksum field. When present, the checksum is calculated as a bitwise exclusive of the characters between the '$' and '*'. As an ASCII representation, the number of digits in each number will vary depending on the number and precision, hence the record length will vary. Certain fields may be omitted if they are not used, in which case the field position is reserved using commas to ensure correct interpretation of subsequent fields.

$GPGGA

This message transfers global positioning system fix data. Following is an example.

$GPGGA,161229.487,3723.2475,N,12158.3416,W,1,07,1.0,9.0,M, , , ,0000*18

The $GPGGA message structure is shown below:

Field	Example	Unit	Notes
Message ID	$GPGGA		GGA protocol header.
UTC Time	161229.487		hhmmss.sss
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south.
Longitude	12158.3416		dddmm.mmmm
E/W indicator	W		E=east or W=west.
Position Fix Indictor	1		0: Fix not available or invalid. 1: GPS SPS mode, fix valid. 2: Differ. GPS, SPS mode, fix valid 3-5: Not supported. *6: Dead Reckoning Mode, fix valid.* (1)
Satellites Used	07		Number of satellites used to calculate fix. Range 0 to 12.
HDOP	1.0		Horizontal Dilution of Precision.
MSL Altitude (2)	9.0	Meter	Altitude above mean seal level.
Units	M	Meter	M stands for “meters”.
Geoid Separation (2)		Meter	Separation from Geoids can be blank.
Units		Meter	M stands for “meters”.
Age of Diff. Corr.		Second	Age in seconds. Blank (Null) fields when DGPS is not used.
Diff Ref. Station ID	0000		
Checksum	*18		
<CR> <LF>			Message terminator.

(1) Only apply to NMEA version 2.3 (and later) in this NMEA message description.

(2) **SiRF does not support geoid corrections. Values are WGS84 ellipsoid heights.**

$GPGLL

This message transfers geographic position, latitude, longitude, and time. Following is an example.

$GPGLL,3723.2475,N,12158.3416,W,161229.487,A,A*41

The $GPGLL message structure is shown below:

Field	**Example**	**Unit**	**Notes**
Message ID	$GPGLL		GLL protocol header.
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south.
Longitude	12158.3416		dddmm.mmmm
E/W indicator	W		E=east or W=west.
UTC Time	161229.487		hhmmss.sss
Status	A		A: Data valid or V: Data invalid.
Mode	*A*		*A=Autonomous, D=DGPS, E=DR (Only present in NMEA version 3.00).*
Checksum	*41		
<CR><LF>			Message terminator.

$GPGSA

This message transfers DOP and active satellites information. Following is an example.

$GPGSA,A,3,07,02,26,27,09,04,15, , , , , ,1.8,1.0,1.5*33

The $GPGSA message structure is shown below:

Field	Example	Unit	Notes
Message ID	$GPGSA		GSA protocol header.
Mode A			M: Manual, forced to operate in selected 2D or 3D mode. A: Automatic switching between modes.
Mode 3			1 Fix not available. 2 2D position fix. 3 3D position fix.
Satellites Used (1)	07		SV on channel 1.
Satellites Used (1)	02		SV on channel 2.
…			..
Satellites Used (1)			SV on channel 12.
PDOP	1.8		
HDOP	1.0		
VDOP	1.5		
Checksum	*33		
<CR> <LF>			Message terminator.

(1) Satellites used in solution.

$GPGSV

This message transfers information about satellites in view. The $GPGSV message structure is shown below. Each record contains the information for up to 4 channels, allowing up to 12 satellites in view. In the final record of the sequence the unused channel fields are left blank with commas to indicate that a field has been omitted. Following is an example.

$GPGSV,2,1,07,07,79,048,42,02,51,062,43,26,36,256,42,27,27,138,42*71
$GPGSV,2,2,07,09,23,313,42,04,19,159,41,15,12,041,42*41

The $GPGSV message structure is shown below:

Field	Example	Unit	Notes
Message ID	$GPGSV		GSA protocol header.
Number of messages (1)	2		Number of messages, maximum 3.
Message number	1		Sequence number, range 1 to 3.
Satellites in view	07		Number of satellites currently in view.
Satellite ID	07		Channel 1, ID range 1 to 32.
Elevation	79	degree	Elevation of satellite, maximum 90.
Azimuth	048	degree	Azimuth of satellite, range 0 to 359.
SNR (C/N_0)	42	dBHz	Range 0 to 99, null when not tracking.
Satellite ID	02		Channel 2, ID range 1 to 32.
Elevation	51	degree	Elevation of satellite, maximum 90.
Azimuth	062	degree	Azimuth of satellite, range 0 to 359.
SNR (C/N_0)	43	dBHz	Range 0 to 99, null when not tracking.
Satellite ID	26		Channel 3, ID range 1 to 32.
Elevation	36	degree	Elevation of satellite, maximum 90.
Azimuth	256	degree	Azimuth of satellite, range 0 to 359.
SNR (C/N_0)	42	dBHz	Range 0 to 99, null when not tracking.
Satellite ID	27		Channel 4, ID range 1 to 32.
Elevation	27	degree	Elevation of satellite, maximum 90.
Azimuth	138	degree	Azimuth of satellite, range 0 to 359.
SNR (C/N_0)	42	dBHz	Range 0 to 99, null when not tracking.
Checksum	*71		
<CR> <LF>			Message terminator.

(1) Depending on the number of satellites tracked multiple messages of GSV data may be required.

$GPMSS

This message transfers information about radio beacon signal-to-noise ratio, signal strength, frequency, etc. Following is an example.

$GPMSS,55,27,318.0,100,1,*57

The $GPMSS message format is shown below.

Field	**Example**	**Unit**	**Notes**
Message ID	$GPMSS		MSS protocol header.
Signal Strength	55	dB	SS of tracked frequency.
Signal-to-Noise Ratio	27		dB SNR of tracked frequency.
Beacon Frequency	318.0	kHz	Currently tracked frequency.
Beacon Bit Rate	100		Bits per second.
Channel Number (1)	*1*		*The channel of the beacon being used if a multi-channel beacon receiver is used.*
Checksum	*57		
<CR> <LF>			Message terminator.

(1) Fields marked in italic red apply only to NMEA version 2.3 (and later) in this NMEA message description.

$GPRMC

This message transfers recommended minimum specific GNSS data. Following is an example.

$GPRMC,161229.487,A,3723.2475,N,12158.3416,W,0.13,309.62,120598, ,*10

The $GPRMC message format is shown below.

Field	Example	Unit	Notes
Message ID	$GPRMC		RMC protocol header.
UTC Time	161229.487		hhmmss.sss
Status	A		A: Data valid or V: Data invalid.
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south.
Longitude	12158.3416		ddmm.mmmm
E/W indicator	W		E=east or W=west.
Speed over ground	0.13	knot	Speed over ground
Course over ground	309.62	degree	Course over ground
Date	120598		ddmmyy, current date.
Magnetic variation (1)		degree	Not used.
Mode (2)	*A*		*A=Autonomous, D=DGPS, E=DR.*
Checksum	*10		
<CR> <LF>			Message terminator.

(1) SiRF does not support magnetic declination. All "course over ground" data are geodetic WGS84 directions.

(2) Fields marked in italic red apply only to NMEA version 2.3 (and later) in this NMEA message description.

$GPVTG

This message transfers velocity, course over ground, and ground speed. Following is an example.

$GPVTG,309.62,T, ,M,0.13,N,0.2,K,A*23

The $GPVTG message format is shown below.

Field	Example	Unit	Notes
Message ID	$GPVTG		VTG protocol header.
Course (true)	309.62	degree	Measured heading
Reference	T		T = true heading
Course (magnetic)		degree	Measured heading
Reference (1)	M		M = magnetic heading (1)
Speed	0.13	knot	Speed in knots
Units	N		N = knots
Speed	0.2	km/hr	Speed
Units	K		K = km/hour.
Mode (2)	*A*		*A=Autonomous, D=DGPS, E=DR.*
Checksum	*23		
<CR> <LF>			Message terminator.

(1) SiRF does not support magnetic declination. All "course over ground" data are geodetic WGS84 directions.

(2) Fields marked in italic red apply only to NMEA version 2.3 (and later) in this NMEA message description.

$GPZDA

This message transfers UTC Time and Date. Following is an example.

$GPZDA,181813,14,10,2003,00,00*4F

The $GPZDA message format is shown below.

Field	Example	Unit	Notes
Message ID	$GPZDA		ZDA protocol header.
UTC Time	181813		Either using valid IONO/UTC or estimated from default leap seconds.
UTC Day	14		01 to 31, day of month.
UTC Month	10		01 to 12.
UTC Year	2003		1980 to 2079.
Local zone hours	00		Offset from UTC (set to 00).
Local zone minutes	00		Offset from UTC (set to 00).
Checksum	*4F		
<CR> <LF>			Message terminator.

Appendix: Time Zone Table

Time Zone Name	Coordinated Universal Time	Daylight Saving Time
Eniwetok, Kwajalein	-12	
Midway Island, Samoa	-11	-
Hawaii	-10	-
Alaska	-9	-8
Pacific Time (US and Canada); Tajuana	-8	-7
Mountain Time (US and Canada), Chihuahua, La Paz, Mazatlan, Arizona	-7	-6
Central Time (US and Canada), Saskatchewan, Guadalajara, Mexico City, Monterrey, Central America	-6	-5
Eastern Time (US and Canada), Indiana (East), Bogota, Lima, Quito	-5	-41
Atlantic Time (Canada), Caracas, La Paz, Santiago	-4	
Newfoundland	-3.5	-2.5
Brasilia, Buenos Aires, Georgetown, Greenland	-3	
Mid-Atlantic	-2	
Azores, Cape Verde Islands	-1	
Greenwich Mean Time: Dublin, Edinburgh, Lisbon, London, Casablanca, Monrovia	+0	+1
Amsterdam, Belgrade, Bratislava, Budapest, Ljubljana, Prague, Sarajevo, Skopje, Warsaw, Zagreb, Brussels, Copenhagen, Madrid, Paris, Berlin, Bern, Rome, Stockholm, Vienna, West Central Africa	+1	+2
Athens, Istanbul, Minsk	+2	+3
Bucharest, Cairo, Pretoria, Jerusalem, Harare, Pretoria	+2	+3
Helsinki, Riga, Israel, Kyiv, Sofia, Tallinn, Vilnius	+2	+3
Baghdad, Kuwait, Riyadh, Nairobi	+3	+4
Moscow, St. Petersburg, Volgograd	+3	+4
Tehran	+3.5	+4.5

Time Zone Name	Coordinated Universal Time	Daylight Saving Time
Abu Dhabi, Muscat, Baku, Tbilisi, Yerevan	+4	-
Kabul	+4.5	-
Ekaterinburg, Islamabad, Karachi, Tashkent	+5	-
Bombay, Calcutta, Madras, New Delhi, Chennai, Kolkata	+5.5	-
Almaty, Dhaka, Colombo, Astana, Sri Jayawardenepura, Novosibirsk	+6	-
Bangkok, Hanoi, Jakarta, Krasnoyarsk	+7	-
Beijing, Changqing, Hong Kong, Uramqi	+8	-
Perth, Singapore, Taipei, Beijing, Chongqing, Hong Kong SAR, Kuala Lumpur, Irkutsk, Ulaan Bataa	+8	-
Osaka, Sapporo, Tokyo	+9	-
Seoul, Yakutks	+9	-
Adelaide, Darwin	+9.5	-
Brisbane, Guam, Port Moresby	+10	-
Canberra, Melbourne, Sydney	+10	-
Hobart, Vladivostok	+10	-
Magadan, Solomon Islands, New Caledonia	+11	+12
Auckland, Wellington	+12	-
Fiji Islands, Kamchatka, Marshall Islands	+12	-

*Unit: hour

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